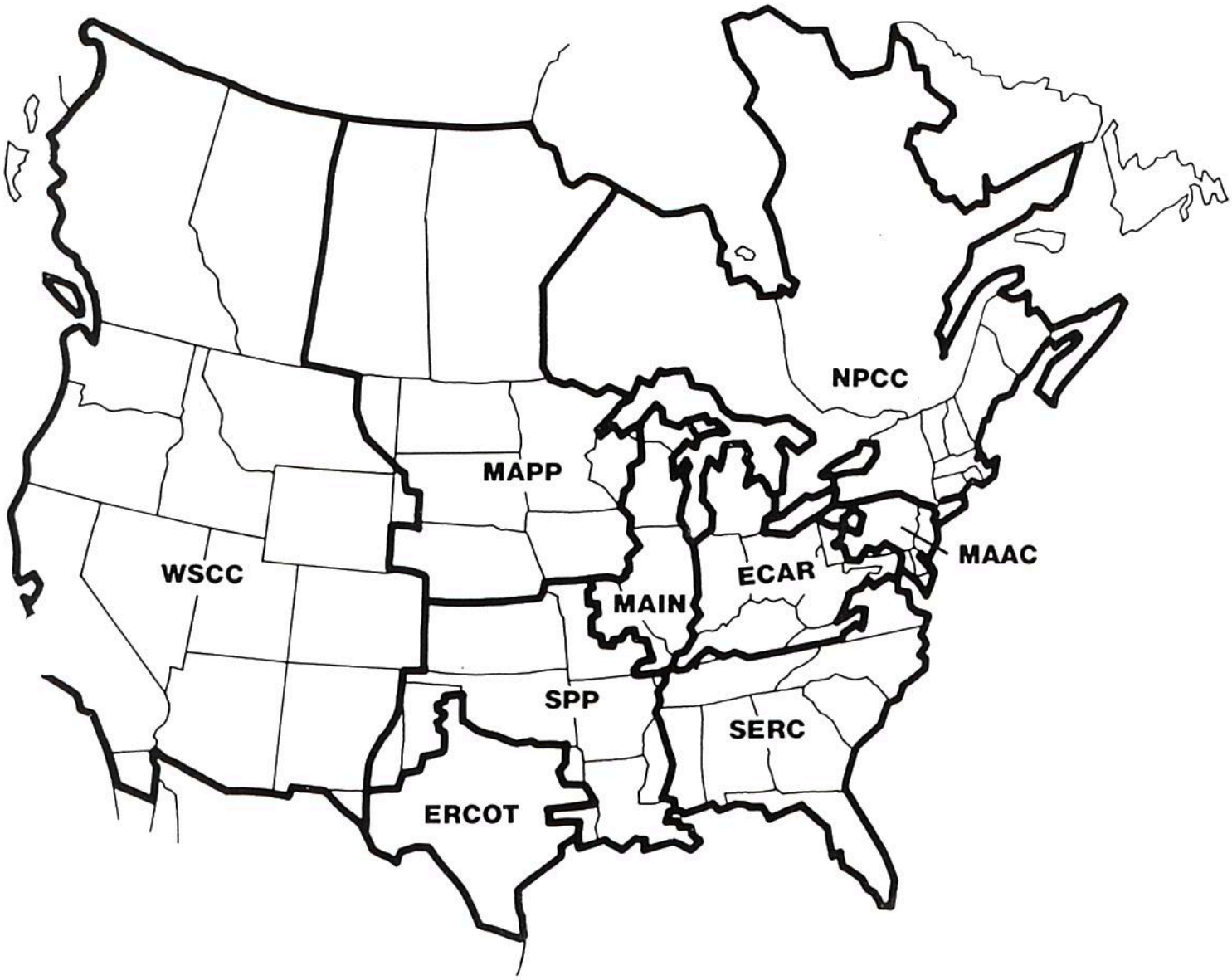
North American Electric Reliability Council



ECAR
East Central Area Reliability Coordination Agreement

ERCOT
Electric Reliability Council of Texas

MAAC
Mid-Atlantic Area Council

MAIN
Mid-America Interconnected Network

MAPP
Mid-Continent Area Power Pool

NPCC
Northeast Power Coordinating Council

SERC
Southeastern Electric Reliability Council

SPP
Southwest Power Pool

WSCC
Western Systems Coordinating Council

AFFILIATE

ASCC
Alaska Systems Coordinating Council

Regional Comparison of Growth Factors: 1990 to 2005

Growth Indicator	Growth Factor for: Pennsylvania	Philadelphia MSA (9 counties in PA and NJ)	Philadelphia NAA (5 counties in PA)
Population	1.052	1.066	1.045
Employment-Total	1.107	1.119	1.082
Employment-Durable Goods	0.938	0.956	N/A
Employment-Farm	0.923	0.848	N/A
Earnings-Construction	1.165	1.130	N/A
Earnings-Farm	1.136	1.151	N/A

Alternative Growth Factors by Source Category

Source Category	Current Growth Factor	Potential Alternative Growth Factor(s)
Point Sources	BEA Earnings - PA (1990)	BEA Gross State Product (1995)
Area Sources:		
Nonindustrial Solvent Use	BEA Population - PA (1990)	BEA Population - Philadelphia MSA
Petroleum Product Marketing	VMT - PA	Gasoline Usage - Philadelphia NAA
Waste Disposal	BEA Population - PA (1990)	BEA Population - Philadelphia NAA
Industrial Solvent Use	BEA Employment - PA (1990)	BEA Employment - PA (1995)
Nonroad Sources:		
Aircraft	BEA Employment - Air Transportation	FAA Landing-Takeoff Activity
Agricultural Equipment	BEA Employment - Farm - PA	BEA Employment - Farm - Philadelphia NAA Projections of Agricultural Land Use (if available)
Marine Vessels	BEA Employment - Water Transportation	Regional Shipping Activity (if available)
Railroads	BEA Employment - Rail Transportation	Regional Rail Activity - Freight and Passenger (if available)

Expected Directional Changes in Emissions by 2005
Four State Region (DE, MD, NJ, PA)
VOC Emissions

Source Categories	1990 Emissions Contribution	2005 Emissions Contribution	Percentage Reduction from 1990	Contribution to Reduction
Area/Nonroad	56%	57%		54%
Non-Utility Point	13	16		4
Utility	0	0		0
Highway Vehicle	31	26		42
Total			31%	100%

Expected Directional Changes in Emissions by 2005
Four State Region (DE, MD, NJ, PA)
NO_x Emissions

Source Categories	1990 Emissions Contribution	2005 Emissions Contribution	Percentage Reduction from 1990	Contribution to Reduction
Area/Nonroad	20%	25%		(2)%
Non-Utility Point	10	10		7
Utility	32	27		51
Highway Vehicle	38	37		44
Total			18%*	100%

NOTE: *This does not include the OTC NO_x MOU Stationary Source Program Benefits.

Expected Directional Changes in Emissions by 2005
Four State Region (DE, MD, NJ, PA)
NO_x Emissions with OTC NO_x MOU Effects

Source Categories	2005 Emissions Contribution	Percentage Reduction from 1990	Contribution to Reduction
Area/Nonroad	30%		(2)%
Non-Utility Point	11		7
Utility	15		75
Highway Vehicle	45		19
Total		37%	100%

Federal Measures Since 1990 Amendments

Measure	Form	% VOC Reduction	Date
Synthetic Organic Chemical Manufacturing Industry (SOCMI) - Distillation and Reactor Processes	CTG	83%	11/93
Volatile Organic Liquid Storage	ACT	95%	1/94
SOCMI Batch Processes	ACT	70%	2/94
Industrial Waste Water	ACT	65%	4/94
Plastic Parts Coating (for business machines and automobiles)	ACT	45%	2/94
Cleaning Solvents	ACT	25%	2/94
Offset Lithography	ACT	80%	6/94
Shipbuilding Coatings	ACT	24%	4/94
Shipbuilding (the CTG will be similar to the MACT standard issued December 1995)	CTG	24%	6/96
Autobody Refinishing	ACT	37%	4/94
Autobody Refinishing	Proposed National Rule	37%	3/96
Wood Furniture	Draft CTG	30%	4/96
Aerospace (draft RACT recommendation to be in supplemental rulemaking on the MACT standard. The MACT rule was final in Sept. 1995)	Draft MACT	60%	3/96
Marine Vessel Loading	Final National Rule	80%	7/95
Aerosol Spray Paints (this rule may be postponed for several years)	Proposed National Rule	Not Known	Indefinite
Architectural and Industrial Maintenance Coatings (AIM)	Proposed National Rule	20%	4/96

Summary of Potential Control Measures for VOC and NO_x by Source Category

		Control Measure	Description	Effectiveness VOC tpd	Effectiveness NO_x tpd	
	VOC Emissions: Surface Coating and Solvent Use					
1	Industrial Surface Coating (Includes Wood and Metal Products)	(Add-on Controls or VOC Content Limits)	Extending the required RACT standards to smaller VOC sources not covered by EPA's Control Technique Guidance (CTG) documents; or requiring more stringent limits, improved transfer efficiency, or add-on controls.		36%	
2	Surface Coating - Aerospace	Extend RACT, VOC Content Limit				
3	Autobody Refinishing	(VOC Content Limits); CA Best Available Retrofit Control Technology	A national rule proposing VOC content limits has been proposed. National rule will achieve a 36% VOC reduction. Can establish more stringent VOC content limits for coatings, require control equipment to improve transfer efficiency, and require add-on controls.		10-20%	16.3
4	Surface Cleaning/Degreasing	CARB's Best Available Control Technology; Low- VOC Solvents	Establishes low-VOC targets for solvents; and application methods with high collection and destruction efficiencies.			
	VOC Emissions: Petroleum Operations, Refueling, Fugitive Emissions					
5	Gasoline Service Stations: Underground Storage Tanks	Install Pressure Vacuum (PV) Valves on Vent Line	Prevent excessive release of gasoline vapors from storage tank vent pipe. Reduces breathing emissions by 99%.	99%		1.7 T/D
6	Bulk Terminals	Vapor Recovery System	Reduce VOC emissions during gasoline truck tank loading. Gasoline loading racks are already required to have a vapor collection adaptor and a vapor tight seal.			0.7 T/D
7	Petroleum Refinery Fugitive Emission Leaks	Inspection and Maintenance Program	Improve compliance with RACT through increased inspection frequency. Monitoring programs are already required for monthly, quarterly and annual inspections depending on service/type.			12.5 T/D
	VOC Emissions: Miscellaneous Sources					
8	Rule Effectiveness Improvements	Increase Compliance with Regulations	Options include inspections and other enforcement activities.			

		Control Measure	Description	Effectiveness VOC tpd	Effectiveness NO_x tpd
	VOC Emissions: Miscellaneous Sources (continued)				
9	Web Offset Lithography	(Carbon Adsorber)	Require controls beyong CTG, such as enclosure installation, and VOC limits for inks.		
10	Graphic Arts	(Low-VOC Inks and Cleaning Solvents)	Extend RACT requirements to small establishments. VOCs from rotogravure and flexographic printing presses have been regulated for major sources since 1987.		20.1
11	Adhesives: Industrial	Reformulation and Product Substitution	Reduce VOC through improved coating types.		
12	Pesticides	Reformulation to Lower VOC Content	Based on California Ozone FIP rule; prohibits use of pesticides above specific VOC limits.	20%	
	NO_x Emissions: Fuel Combustion				
13	Utility Boilers	(Low-NO_x Burner [LNB])	Options include requiring units to meet emission standards beyond RACT requirements based on energy output or heat input. Control techniques vary by boiler type and fuel type. May also be controlled through OTC Memorandum of Understanding.		
	Coal-Fired Boiler	(LNB + Overfire Air)			60-90%
		Selective Catalytic Reduction (SCR)			30-50%
		Natural Gas Reburn (NGR)			35-50%
		Natural Gas Substitution			
		Selective Noncatalytic Reduction (SNCR)			30-40%
	Oil/Gas-Fired Boiler	LNB			20-40%
		SCR			80-95%
		NGR			30-60%
		NGS			10-50%
		SNCR			10-40%
14	Industrial Boilers	(LNB)	Control options include establishing emission limits beyond RACT requirements. Control techniques vary by boiler type and fuel type. Large industrial boilers may also be controlled through OTC Memorandum of Understanding.		
		(LNB + Overfire Air)			
		SCR			
		NGR			
		Natural Gas Substitution			
		SNCR			

		Control Measure	Description	Effectiveness VOC tpd	Effectiveness NO_x tpd
	NO_x Emissions: Fuel Combustion (continued)				
NO SOURCES	~~15~~ Adipic Acid Manufacturing Plants	Thermal Reduction	No facilties in five county area. Limits can be set on pounds of NO_x per ton of acid produced.		
"	~~16~~ Nitric Acid Manufacturing Plants	Extended Absorption	No facilties in five county area.		
		SCR			25%
		Nonselective Catalytic Reduction (NSCR)			55%
"	~~17~~ Cement Manufacturing	LNB SCR SNCR (Urea-based)	Require combustion controls and post-combustion controls to achieve reductions on certain processes. Not found in five county inventory		
SHUTDOWN SINCE 1990	~~18~~ Glass Manufacturing	LNB SCR Oxy-Firing	Require combustion modifications and process changes to achieve reductions beyond those required by RACT.		35-50% 45%
	19 Gas Turbines: Natural Gas	LNB	Presumptive RACT is water/steam injection or low NO_x combustion.		15%
		SCR + Steam Injection			
	20 Gas Turbines: Oil	Water Injection	Presumptive RACT is water/steam injection or low NO_x combustion.		15%
		NSCR + Water Injection			
	21 Reciprocating IC Engines: Diesel/Oil	Ignition Timing Retard SCR	Presumptive RACT is ignition timing retard.		40-70%
	22 Reciprocating IC Engines: Natural Gas	Air/Fuel (AF) Ratio Adjustment + ITR NSCR	Presumptive RACT is ignition timing retard.		50-88%
	23 Process Heaters: Natural Gas or Oil	Ultra-Low-NO_x Burners (ULNB)			
		LNB + SCR			90%
		LNB + SNCR			75%

		Control Measure	Description	Effectiveness VOC tpd	Effectiveness NO_x tpd
	NO_x Emissions: Fuel Combustion (continued)				
24	Iron and Steel Mills	LNB + FGR LNB + SNCR LNB + SCR	Control NO_x emissions from reheating, annealing, and galvanizing furnaces.		10% 30% 35%
25	Industrial, Commercial, and Institutional Combustion	RACT to Small Sources	Extend RACT requirements to smaller sources.		
26	Residential Water Heaters	LNB	New heaters would be required to have low NO_x burners.		44%
27	Residential Space Heaters	LNB	Programs can provide incentives to replace older heaters.		44%
28	Medical Waste Incinerators	SNCR	Control NO_x from sterilization techniques.		45%
29	Municipal Waste Incinerators	SNCR	Set limits beyond EPA's requirements for large facilities.		45%
30	Various	Small Business Tax Incentives			
31	Highway Vehicles	Ozone destroying paint - air handling systems, car radiators	The PremAir system involves coating a radiator's core with a platinum-based catalyst.		
32	Asphalt Paving	Driveways - Non-HC Asphalt	Prohibit cutback asphalt to be used for re-paving driveways		
33	Consumer Solvents	Driveways - Sealer Low VOC	Low VOC or water-based sealers are currently available for sale. Do cost and performance differ from VOC-based sealers?		
34	Transportation	Land Use Planning - Promote Community Centers			
	VOC and NO_x Emissions: On-highway Motor Vehicles				
35	Light-, Medium-, and Heavy-Duty Diesel Vehicles and Trucks	California Reformulated Diesel Program	CA limits the sulfur content and aromatic hydrocarbon content of motor vehicle diesel fuel.	0%	4-7%
36	Light-Duty Gasoline Vehicles and Trucks	More Remote Sensing	The enhanced I/M remote sensing program could be expanded. No guidance yet from EPA on remote sensing credits.		

		Control Measure	Description	Effectiveness VOC tpd	Effectiveness NO_x tpd
37	Light-Duty Gasoline Vehicles and Trucks	Scrappage Programs	Early retirement of older, higher emitting vehicles.		
38	Heavy-Duty Diesel Trucks	Vehicle Emission Inspections	Some States are considering emission tests of heavy trucks. Primary benefit is to reduce emissions of NO_x and particulates.		
39	Light-, Medium-, and Heavy-Duty Diesel Vehicles and Trucks	Emission-Based Registration Fees	Vehicle operators are charged a registration fee based on annual mileage times the emission rate of one or more pollutants.		
	VOC and NO_x Emissions: On-highway Motor Vehicles (continued)				
40	Light-Duty Vehicles and Light-Duty Trucks	Eliminate Excessive Car Dealership Vehicle Starts	Limit car dealers to one fleet engine start-up every two weeks.		
41	All Vehicles	Eliminate Excessive Curb Idling	Limit idling time to 3 minutes.		
42	Urban Buses	Emissions Reduction Credit for Heavy-Duty Buses	Issue emission reduction credit for implementation of low emission buses; require the use of low emission buses (natural gas, methanol, electric trolleys)		
43	All Vehicles	Smoking Vehicle Program	Establishes a call-in line to report vehicles with excessive smoke emissions. Existing programs in SF Bay Area and South Coast. Send strongly worded letter to vehicle owner.		
44	Highway Vehicles	Traffic Flow Improvements	Advanced signal system or 50 miles of the most congested 4 lane arterials	0.15 0.2%	0.16 0.1%
45	Highway Vehicles	Traffic Flow Improvements	Advanced signal system improvements - Comprehensive system for Philadelphia CBD	0.35 -0.0%	0.27 -0.0%
46	Highway Vehicles	Traffic Flow Improvements	Congestion and incident management systems on interstates within Philadelphia and the four suburban counties	0.16 -0.2%	0.07 0.0%

45 second is break point of energy for idle vs. stop/start

		Control Measure	Description	Effectiveness VOC tpd	Effectiveness NO_x tpd
47	Highway Vehicles	Traffic Flow Improvements	Ramp metering	0.41 -0.5%	0.34 -0.0%
48	Highway Vehicles	Traffic Flow Improvements	Enforce adherence to 55 mph speed limit on PA Turnpike	0.18 -0.2%	0.63 -0.5%
49	Highway Vehicles	Transit Operations	Restoration of service on regional rail lines	0.01 -0.0%	0.02 -0.0%
50	Highway Vehicles	Transit Operations	Extension of Route 66 trackless trolley	0.00 -0.0%	0.00 -0.0%
	VOC and NO_x Emissions: On-highway Motor Vehicles (continued)				
51	Highway Vehicles	Transit Operations	Improvement to express service on regional rail lines	0.02 -0.0%	0.03 -0.0%
52	Highway Vehicles	Transit Operations	Systemwide fare reductions of 10%	0.09 -0.1%	0.13 -0.1%
53	Highway Vehicles	Transit Operations	Systemwide fare reductions of 20%	0.20 -0.2%	0.26 -0.2%
54	Highway Vehicles	Transit Operations	Systemwide fare reductions of 50%	0.47 -0.5%	0.69 -0.6%
55	Highway Vehicles	Transit Operations	Improve suburban bus service	0.07 -0.1%	0.10 -0.1%
56	Highway Vehicles	Transit Operations	Application of "transit first" principles in Philadelphia	0.02 -0.0%	0.02 -0.0%
57	Highway Vehicles	Transit Operations	Reuse of surplus LRVs and trackless trolleys on bus routes in Philadelphia	0.01 -0.0%	0.01 -0.0%
58	Highway Vehicles	Transit Operations	Improve City Transit Division Service	0.09 -0.1%	0.09 -0.1%
59	Highway Vehicles	Transit Operations	Philadelphia to Harrisburg rail service improvements	0.01 -0.0%	0.03 -0.0%

		Control Measure	Description	Effectiveness VOC tpd	Effectiveness NO_x tpd
60	Highway Vehicles	Transportation Management Plans	Implementation of ETRP in Pennsylvania (all APO targets reached)	1.80 -2.0%	2.20 -1.8%
61	Highway Vehicles	Transportation Management Plans	Comprehensive regional ridesharing program (d)	0.30 -0.3%	0.33 -0.3%
62	Highway Vehicles	Transportation Management Plans	Availability and promotion of $25 Transitchek (d)	0.12 -0.1%	-.14 -0.1%
63	Highway Vehicles	Transportation Management Plans	Telecommuting (d)	0.59 -0.7%	0.68 -0.6%
	VOC and NO_x Emissions: On-highway Motor Vehicles (continued)				
64	Highway Vehicles	Transportation Management Plans	Compressed work weeks (9/80)	0.21 -0.2%	0.27 -0.2%
65	Highway Vehicles	Parking Management	Prohibit new construction of parking facilities in Center City	Negligible Impact	
66	Highway Vehicles	Parking Management	Limit parking facilities at new suburban employment sites	0.08 -0.1%	0.08 -0.1%
67	Highway Vehicles	Parking Management	$3.00 parking surcharge paid by all regional employees arriving in private vehicles	1.90 -2.2%	2.50 -2.0%
68	Highway Vehicles	Parking Management	Institute a $3.00 parking tax in the Philadelphia CBD to be paid by all employees	0.47 -0.5%	0.73 -0.6%
69	Highway Vehicles	Parking Management	Construct new park and ride lots along highways	0.05 -0.1%	0.08 -0.1%
70	Highway Vehicles	Parking Management	Expand parking at rail stations	0.11 -0.1%	0.19 -0.2%
71	Highway Vehicles	Non-Motorized Programs and Facilities	Comprehensive bicycle improvements in the region that would capture 5% of auto work trips $\leq$ 5 miles	0.21 -0.2%	0.18 -0.1%

		Control Measure	Description	Effectiveness VOC tpd	Effectiveness NO_x tpd
72	Highway Vehicles	Non-Motorized Programs and Facilities	Comprehensive bicycle improvements in the region that would capture 5% of access trips of $\leq$ 5 miles for work purposes to 14 selected rail stations	0.00 -0.0%	0.00 -0.0%
73	Highway Vehicles	Non-Motorized Programs and Facilities	Comprehensive bicycle improvements in the region that would capture 5% of non-work trips $\leq$ 5 miles	0.33 -0.4%	0.34 -0.3%
74	Highway Vehicles	Emissions Reduction Programs	Removal of 50% of pre-1980 vehicles	5.00 -5.7%	2.50 -2.0%
	VOC and NO_x Emissions: On-highway Motor Vehicles (continued)				
75	Highway Vehicles	Emissions Reduction Programs	Reduction in cold starts	1.00 -1.1%	0.63 -0.5%
76	Highway Vehicles	Emissions Reduction Programs	California cars	0.57 -0.7%	0.79 -0.7%
77	Highway Vehicles	Pricing Mechanisms	Feebate on purchase of new car	0.28 -0.3%	0.17 -0.1%
78	Highway Vehicles	Pricing Mechanisms	Comprehensive gas tax of $.84 per gallon	5.20 -6.0%	8.70 -7.2%
79	Highway Vehicles	Pricing Mechanisms	VMT tax of $.04	5.20 -6.0%	8.70 -7.2%
80	Highway Vehicles	Pricing Mechanisms	Double tolls on PA Turnpike during peak periods	0.01 -0.0%	0.00 0.0%
81	Highway Vehicles	Emission Reduction Programs	Alternative Fuel Vehicles SEPTA		
82	Highway Vehicles	Transit Operations	Reduce SEPTA Fares July-August		
83	Highway Vehicles	Pricing Mechanisms	High occupancy vehicle parking rate incentive		

		Control Measure	Description	Effectiveness VOC tpd	Effectiveness NO_x tpd
84	Highway Vehicles	Transit Operations	Grants to non-profits to promote mass transit		
85	Highway Vehicles	Stage II - Entire Region (Beyond 5 County)	Not currently required outside five county area.	60-70%	0
86	Highway Vehicles	Stage II - Statewide		60-70%	0
87	Highway Vehicles	Ride Sharing			
	VOC and NO_x Emissions: On-highway Motor Vehicles (continued)				
88	Highway Vehicles	Increase Mass Transit Ridership - Parking Taxes, Market Incentives			
89	Highway Vehicles	Flat Tax on Vehicles - $200?			
90	Highway Vehicles	Build Two-Tier Highways			
91	Highway Vehicles	High Occupancy Vehicle Lanes			
92	Highway Vehicles	Traffic Flow @ 45 mph	Optimal speed to maximize fuel economy and minimize emissions		
93	Highway Vehicles	Insulate Catalytic Converters	Reduce cold start effects		
94	Highway Vehicles	Promote Telecommuting			
95	Highway Vehicles	Credits for Compressed Work Week			
96	Highway Vehicles	LPG - Pilot Programs at Service Stations			

		Control Measure	Description	Effectiveness VOC tpd	Effectiveness NO_x tpd
97	Highway Vehicles	Non-Employee Trip Reduction - Health Clubs	Ridesharing to non-work destinations		
98	Highway Vehicles	Buy New Engines for SEPTA - CNG, LPG			
99	Highway Vehicles	Clean Fleet Replacement for Institutions, Large Businesses			
100	Highway Vehicles	Area Source Business - Credits for Alternative Fuel Vehicles			
	VOC and NO_x Emissions: On-highway Motor Vehicles (continued)				
101	Highway Vehicles	Voluntary ETR			
102	Highway Vehicles	Alternative Fuel Vehicle - Build Fuel Stations			
	VOC and NO_x Emissions: Nonroad Vehicles				
103	Marine Vessels	Control of Emissions (NO_x) from Ships and Ports	Reduce cruising speeds; engine modifications; clean fuels for shore side equipment; port infrastructure improvements.	0%	30%
104	Commercial Marine Vessels	Emission fees	Based on California Ozone FIP rule; imposes NO_x emission fee of $10,000 per ton on vessel operators.	0%	30%
105	Lawn and Garden	Emission Reduction Credits for Leaf Blowers; Electric Lawnmowers	Provide credits for local governments (or other entities) that prohibit leaf blowers, or replace with non-polluting alternatives.		
106	Lawn and Garden	Incentives for Electric Lawnmowers	Trade-in gasoline engine mowers for electric. Businesses can earn credits for offering rebates, discounts or other incentives for homeowners to trade-in equipment.		

		Control Measure	Description	Effectiveness VOC tpd	Effectiveness NO_x tpd
107	Nonroad	Nonroad Engine Emission Reduction Credit Programs	Provide credits for accelerated retirement and replacement of old engines/vehicles with zero or low-emitting units.		
108	Locomotives	Regional Railroad NO_x Emissions Reduction Measure	Advanced diesel technologies, clean fuels, aftertreatment technologies, electrification.	0%	35-43%
109	Aircraft	Control of Emissions from Aircraft and Ground Support Equipment	Single/reduced engine taxiing, reduced airport airside congestion, reduce takeoff power, use only low-emitting aircraft, tow aircraft to runway, increase load factor, GSE electrification.		35-45%
110	Locomotive Engines	Potential Federal NO_x Emission Standards	Establishes emission standards to be met by modifying locomotive engines.		35-43%
		Potential CA NO_x Emission Standards			80%
	VOC and NO_x Emissions: Nonroad Vehicles (continued)				
111	≥175 horsepower Compression Ignition (Diesel) Engines: Construction Equipment: Scrapers, Bore/Drill Rigs, Excavators, Cranes, Off-Highway Trucks, Rubber Tired Dozers, and Off-Highway Tractors Logging Equipment: Fellers/Bunchers	California Phase II Exhaust Standards	Requires modifications to compression ignition engines.		
112	Recreational Vehicles				
	2-stroke engine category	Potential CARB Standards	Requires modifications to small, gasoline-powered engines.		
	4-stroke engine category	Potential CARB Standards			
	VOC and NO_x Emissions: Episodic Measures				
113	Open Burning	Ban on High Ozone Days	Can be implemented when ozone levels are expected to exceed the Federal health standard in order to potentially avoid exceedances.		
114	Open Burning	Year Round Ban			
115	Commercial Lawn Care	Ban on High Ozone Days			
116	All Lawn Care	Ban on High Ozone Days			
117	Recreational Boating	Ban on High Ozone Days			
118	Motor Vehicles	Voluntary "No-Drive" Measure	Encourage public to reduce driving on high-ozone days.		

8.4 VOC
a.6 NOx

		Control Measure	Description	Effectiveness VOC tpd	Effectiveness NO_x tpd
	Emission Trading Programs				
119	All Sources (or a Subset)	Cap and Trade	All existing systems are cap and trade.		
120	All Sources (or a Subset)	Open Market Trade	Proposed rule issued by EPA last fall.		
121	All Sources (or a Subset)	Across the Board Emission Reductions			
	Other				
122	Various	School-Based Public Awareness Ozone Action			
123	Various	Promote We Care Programs to Businesses			
124	Various	Outreach and Education - Environmentally Responsible Behavior - Green Light			
125	Various	Environmental Think Tank			

Green lights

MEASURE NO. 1
SOURCE CATEGORY Industrial Surface Coating
CONTROL MEASURE Add-on Controls or VOC Content Limits

DESCRIPTION

This control measure calls for more stringent VOC limits on surface coating for several industrial surface coating source categories (including industrial adhesives). Included are both point and area wood surface coaters, can coating, miscellaneous metal parts, plastic/rubber/glass parts, fabric/paper, vinyl coating, coil coating, metal furniture/appliances, and industrial adhesives. The proposed rule would amend the existing state rule (PA Title 25 Chapter 129.52) to require more stringent limits on VOC content for coatings from the above sources. The new limits are based largely on either existing SCAQMD limits (SCAQMD, 1993) or CARB RACT/BARCT guidance (CARB, 1992a,b).

For auto body painting (new vehicles) and magnet wire coating, no other VOC limits were identified that were more stringent than the existing PA limits. For can coating, the new limits are based on SCAQMD Rule 1125. For coil coating, the limits are based on CARB RACT/BARCT (CARB, 1992a). For fabric, vinyl, and paper coating, the limits are based on SCAQMD Rule 1128. For metal furniture, large appliances, and miscellaneous metal parts, the limits are based on CARB's RACT/BARCT. For wood furniture, the limits are based on SCAQMD Rule 1136. This control measure also calls for the implementation of RACT on area sources conducting wood furniture coating.

Depending on the specific product involved (e.g., top coat, primer) the VOC limits will be reduced by following approximate values (ranges): Can coatings - 0-33%; Coil Coatings - 35%; Fabric, Vinyl, Paper coatings - 24-41%; metal furniture, appliances, misc. metal parts - 19-47%; wood furniture - 16-34%. For CTG-limits applied to area sources, the estimated VOC limits are up to 55% lower for wood furniture coatings (hydrocarbon-based coatings versus water-based coatings).

1. VOC Content Limits/Add-on Control Equipment for Industrial Surface Coating
COST
Capital Cost N/A Operating and Maintenance Cost N/A Annualized Direct Costs N/A Administrative Costs/Issues Recordkeeping and possibly reporting requirements will be needed to establish compliance. Therefore, additional administrative costs will be

EFFICIENCY

Control Efficiency - % reduction from uncontrolled levels

Estimates are 0 to 90 percent control depending on the stringency of the VOC limits for other programs and the existence of CTG/state limits. Estimates are made based upon the differences in VOC limits even though other aspects of the measure could affect control efficiency (e.g., higher transfer efficiency equipment, lower VOC clean-up solvents).

Wood furniture: Point Sources - Controlled to SCAQMD 1997 limits from existing state limits (30%).
Area Sources - Controlled to CTG/state limits from currently uncontrolled limits (32%).

No more stringent levels were identified than the current state limits for either Auto Body or Magnet Wire coating (0%).

For the remaining categories estimates are from a comparison of state limits (if they exist) versus CARB RACT/BARCT and/or SCAQMD Rule limits: Can Coating (25%); Misc. Metal Parts (30%); Plastic/Rubber/Glass (60%); Fabric/Paper (40%); Cal Coating (35%); Metal Furniture/Appliances (20%); Industrial Adhesives (90%).

Applicability - how many sources, their size

This measure applies to all sources that consume more than 1 gallon of coating per day.

Emission Reductions by Pollutant-estimated reductions -
VOC only, NO_x only, VOC and NO_x combined

VOC only: Assuming coverage of all sources, a minimum of 12.3 tpd in 2005 is expected. Additional reductions are likely from some of the other coating-related categories in the inventory (General Coating, Thinning Solvents, Other).

Permanence

Measurable

Through recordkeeping and reporting requirements, emission reductions could be measured and verified.

Availability

Emissions are assumed to be available for reduction.

COST-EFFECTIVENESS - Most costs were taken from RACT/BARCT reports or the SCAQMD 1994 Air Quality Management Plan. For categories with no available costs, a conservative (high) estimate of $4,000 - 5,000/ton is assumed based on the range of reported costs for the other categories. However, for categories with existing VOC limits, the costs for adoption of more stringent limits may be much lower than the assumed amount, since no new equipment is generally needed (e.g., spray guns).

IMPLEMENTABILITY

Enforcement

Enforcement could be implemented through recordkeeping/reporting requirements.

Ease of Determining Compliance

There is already a requirement for daily recordkeeping in the state rule. Hence, there would not be a significant incremental compliance burden on sources and the implementing agency. The recordkeeping requirement applies to all sources, regardless of size. Hence, even the wood furniture area sources should not be significantly impacted with a recordkeeping requirement.

Implementation Ease

Several States already have low-VOC coating regulations in place (most notably, California). Hence, for the affected categories, the measure is not expected to be technology-forcing.

Timing of Reductions

All VOC limits in the CA rules occur by the year 1997, although most are already in place. Assuming the rule was put into effect by 1998, reductions would occur in 1999.

Publicly Acceptable

No issues are anticipated.

Politically Acceptable

Due to the fact that there are other state or local rules already in affect, there should not be any significant issues regarding political acceptability.

Consensual

Voluntary

Who Pays - Fairness

From the inventory, the only sources that appear to be largely unaffected by the proposed control measure are area sources conducting can coating. These sources are expected to emit about 7.9 tpd in 2005. Therefore, if RACT-level limits were established for these sources, an additional 2.0 tpd in reductions could be garnered.

Location

The rule applies to all sources in the five county area.

SECONDARY EFFECTS

Secondary Pollutant Benefits - CO, HAPS, etc.

Some VOC HAPs are likely to be reduced along with the VOC emissions. If increases in transfer efficiency take place, reductions in PM (from overspray) may also occur.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

With higher solids formulations and transfer efficiency, less material (paint and thinners) will be consumed.

Secondary Costs - energy, etc.

None known.

MEASURE NO. 2
SOURCE CATEGORY Surface Coating - Aerospace
CONTROL MEASURE Extend VOC Content Limits to Small Facilities

DESCRIPTION

2. Extend VOC Content Limits to Small Facilities Performing Aerospace Surface Coating
COST
Capital Cost N/A Operating and Maintenance Cost N/A Annualized Direct Costs N/A Administrative Costs/Issues Costs N/A. Additional administrative burden due to the reporting and recordkeeping requirements associated with coating rules for the smaller sources.
EFFICIENCY
Control Efficiency - % reduction from uncontrolled levels For point sources, no reductions are assumed, since these sources will be covered by the MACT standard. For area sources, a 60% reduction is assumed based on MACT/SCAQMD level VOC limits and operating practices. Applicability - how many sources, their size As per SCAQMD Rule 1124, the requirements apply to the following industries: commercial and military aircraft, satellite, space shuttle and rocket manufacturers and their subcontractors. The rule does not apply to facilities that use less than 3 gallons of VOC containing coatings or solvent per day. The rule also does not apply to coatings that are applied in volumes of less than 20 gal/yr, provided that the total of these coatings does not exceed 200 gal/yr. Emission Reductions by Pollutant-estimated reductions - VOC only, NO_x only, VOC and NO_x combined In 2005, 0.28 tpd of VOC are expected to be reduced.

Permanence

Measurable

Availability

COST-EFFECTIVENESS - Estimated to be $4,000 - $5,000/ton of VOC.

IMPLEMENTABILITY

Enforcement

Enforcement would be implemented through the recordkeeping and reporting requirements.

Ease of Determining Compliance

Compliance would be determined via review of facility reporting material and/or on-site inspections

Implementation Ease

Most of the VOC limits and operating practices are already in place in SCAQMD, so the rule is not technology-forcing.

Timing of Reductions

Assuming that limits could be put in place by 1998, then 1999 should be the year to apply reductions.

Publicly Acceptable

Politically Acceptable

Consensual

Voluntary

Who Pays - Fairness

Location

SECONDARY EFFECTS

Secondary Pollutant Benefits - CO, HAPS, etc.

Likely reductions of VOC HAPs with reformulation. Potential reduction of PM10 with increased transfer efficiency.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

Lower amounts of coatings used on an as-applied solids basis.

Secondary Costs

MEASURE NO. 3
SOURCE CATEGORY Autobody Refinishing
CONTROL MEASURE South Coast, CA Emission Limits

DESCRIPTION

This control measure is based on the adoption of VOC limits for autobody refinishing consistent with the 1997 SCAQMD Rule 1151 coating limits (SCAQMD, 1993). This rule specifies VOC limits for coatings that are more stringent than those specified for 1997 in the Auto Refinishing ACT (EPA, 1994a). SCAPMD provides two sets of limits: one for "Group I Vehicles" (large trucks, buses, and mobile equipment) and another for "Group II Vehicles" (passenger cars, small trucks and vans, medium-sized trucks and vans, motor homes, and motorcycles). A comparison of the VOC limits for Rule 1151 with those from the ACT are given below (all limits are VOC minus water and exempt compounds):

Product	ACT Limit (g/l)	1997 Rule 1151 Group I (g/l)	1997 Rule 1151 Group II (g/l)
Primer/Surfacer	550	250	250
Primer Sealer	550	250	340
Topcoat	600	340	420
Topcoat 3-Stage	625	340	420
Specialty	840	840	840

For the purposes of developing emission reduction estimates below, it is assumed that the refinishing of Group II vehicles contribute most of the emissions for this category.

If these limits are added to the existing PA rule on surface coating, it may be necessary to specify lower VOC emission thresholds (i.e., lower than 3 lb/hr or 15 lb/day) in order to capture auto refinishing operations which are all considered area sources in the inventory. All of the limits are on an as-applied basis. For this reason, SCAQMD did not address point-of-sale issues [i.e., purchase of higher VOC coatings from outside of the nonattainment area (NAA) for use within the NAA]. It is recommended that the proposed control measure be structured in the same way for the five county area.

3. Autobody Refinishing: Require the Use of Low-VOC Paints
COST
Capital Cost N/A. Capital costs are assumed to be $0.00, since no new equipment are needed based on the experiences of the SCAQMD (Latif, 1996). Operating and Maintenance Cost O&M costs are assumed not to change significantly. Some formulations will require longer drying times, however SCAQMD did not report significant operational problems with their facilities (Latif, 1996). Costs for the reformulated products will be slightly higher on a volume basis, but will be partially offset since the solids content will be higher (i.e., there will be more coverage per gallon). Some facilities in the South Coast District have reported longer drying times associated with the use of the reformulated products. There has not been a move by the industry to install drying equipment. Rather, most refinishers are dealing with longer drying times by scheduling their jobs to allow for more drying time (Latif, 1996).

Annualized Direct Costs

Not available.

Administrative Costs/Issues

It would be necessary to establish recordkeeping requirements, so that it can be verified that sources within the NAA are using compliant coatings. Therefore, additional costs can be expected for both industry and regulatory agencies for preparation and review of recordkeeping and reporting materials.

EFFICIENCY

Control Efficiency - % reduction from uncontrolled levels

Reductions are estimated based on the difference between Option 1 VOC limits of the National Rule (EPA, 1995) for primers/primer surfacers and topcoats and the 1995 limits in SCAQMD Rule 1151 for Group II vehicles (SCAQMD, 1993). This assumes equivalent coverage of coatings with either set of limits (this is a conservative assumption, since the reformulated products will likely have greater coverage by volume). Based on the difference in VOC limits, a conservative estimate of 35% VOC emission reductions are assumed.

Applicability - how many sources, their size

Not Available. This control measure will affect a large number of area sources.

Emission Reductions by Pollutant-estimated reductions -
VOC only, NO_x only, VOC and NO_x combined

In 2005, 3.8 tpd of VOC are expected to be reduced.

Permanence

Emission reductions are assumed to be permanent.

Measurable

Emission reductions could be tracked via periodic review of source recordkeeping documentation.

Availability

No availability issues. SCAQMD does not anticipate that refinishers will have difficulty in meeting the 1997 limits (Latif, 1996). Most of the Group I and Group II limits have been in place since 1995. The only exceptions are: Metallic/Iridescent Topcoats for Group I vehicles drop from 420 g/L in 1995 to 340 g/L in 1997; For Group II vehicles, Metallic/Iridescent Topcoats drop from 520 g/L in 1995 to 420g/L in 1997 and Primer Sealers drop from 420 g/L to 340 g/L (SCAQMD, 1993).

COST-EFFECTIVENESS - Conservatively estimated to be $3900-5,800/ton of VOC. The low end of the range is based on the incremental cost effectiveness calculated by EPA for Option III over Option I coatings for the national rule (EPA, 1995). SCAQMD limits are still lower than EPA Option III limits, so the cost effectiveness could be lower. The high end of the range is the cost effectiveness reported in the original 1991 staff report for Rule 1151 (Latif, 1996). These estimates are based on the increased costs for the 1995 VOC limits (products that are currently in use), therefore it is not known how representative they are for the 1997 limits. It is assumed that since the products are already under development for use in the South Coast District, costs associated with product development will likely be lower and that the cost effectiveness will not be greater than the range reported above.

IMPLEMENTABILITY

Enforcement

Enforcement would be implemented through periodic inspection of source recordkeeping requirements.

Ease of Determining Compliance

Compliance would be determined via review of facility recordkeeping material and on-site inspections.

Implementation Ease

The VOC limits of the rule should not be technology-forcing, since SCAQMD refinishers have been using 1995-compliant coatings for over a year. The 1995 limits for Group II Vehicles are nearly the same as those for 1997, with the major exception being primer sealers which drop from 420 g/L in 1995 to 340 g/L in 1997.

Timing of Reductions

Assuming that limits could be put in place by 1998, then 1999 would be the year to apply reductions.

Publicly Acceptable

No issues are anticipated.

Politically Acceptable

Due to the reasonable cost, the availability of low-VOC substitutes, and the fact that SCAQMD refinishers have been using these coatings for over a year, there should not be considerable issues related to political acceptability.

Consensual

Voluntary

Who Pays - Fairness

The control measure is designed to cover all sources in the source category, so the costs are spread evenly among all sources.

Location

?

SECONDARY EFFECTS

Secondary Pollutant Benefits - CO, HAPS, etc.

Likely reductions of VOC HAPs with the use of low-VOC coatings.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

Since the reformulated products will likely have higher solids content, fewer materials (VOC solvent) will be consumed.

Secondary Costs

None identified.

MEASURE NO. 4
SOURCE CATEGORY Degreasing
CONTROL MEASURE Adopt South Coast California Rule

DESCRIPTION

This control measure is based on the proposed amended SCAQMD Rule 1171 (SCAQMD, 1995). The rule requires the use of aqueous solvents for anyone using VOC-containing solvents during the production, repair, maintenance, or servicing of parts, products, tools, machinery, equipment, or general work areas, and to all persons who store and dispose of VOC-containing materials used in solvent cleaning. There are requirements for cleaning devices and methods, as well as storage/disposal and recordkeeping requirements. Notable exemptions are:

1. Cleaning that is carried out in batch-loaded cold cleaners, open-top vapor degreasers, conveyorized degreasers, or film cleaning machines which are regulated under SCAQMD Rule 1122 - Solvent Degreasers;
2. Dry Cleaners (already subject to SCAQMD Rules 1102 and 1421);
3. Semi-conductor manufacturing solvent cleaning operations subject to Rule 1164);
4. Aerospace Assembly and Component Manufacturing Operations subject to Rule 1124;
5. Coatings and Ink Manufacturing subject to Rule 1141.1;
6. Janitorial and Institutional Cleaning;
7. Stripping of cured coatings, cured adhesives, or cured inks;
8. Cleaning operations using solvents with a water content of 98% or more, by weight.

Notable exemptions from the VOC content limits specified in the rule are:

1. Cleaning of solar cells, laser hardware, scientific instruments, and high-precision optics;
2. Cleaning associated with R&D, performance tests, and quality assurance tests.
3. Use of less than 1.5 gallons/day for medical/pharmaceutical applications.

The rule also prohibits the use of CFC's and 1,1,1-TCA for solvent cleaning after January 1, 1997.

4. Solvent Cleaning and Degreasing: Require the Use of Low-VOC Solvents
COST
Capital Cost Not Available. For many of the small users (e.g., auto repair shops) there will be no capital costs, since the equipment is often leased. For larger operations (e.g., industrial), new solvent cleaning tanks equipped with heaters and/or oil skimmers may be needed for the aqueous solvent systems (Liebel, 1996). Operating and Maintenance Cost Not Available. According to SCAQMD, costs are expected to be lower with aqueous systems, since the solvent baths do not have to be serviced as often (Liebel, 1996). Annualized Direct Costs Not Available.

Administrative Costs/Issues

Recordkeeping requirements - Sources are required to keep records of solvent usage unless they are exempted by either of the following: 1) they are not subject to any other recordkeeping requirements of any other rules (e.g., coating rules); 2) solvent cleaning is performed with a solvent which has a water content of at least 98% by weight, or a VOC composite partial pressure of 0.1 mmHg or less at 20 degrees C, or the solvent contains VOC that consists of 12 or more carbon atoms.

EFFICIENCY

Control Efficiency - % reduction from uncontrolled levels

SCAQMD estimated a 40% reduction in VOC (SCAQMD, 1994). This could be a conservative (low) reduction estimate for the Philadelphia NAA, since SCAQMD already had a previous version of the rule in place (which had operational, storage/disposal and recordkeeping requirements).

Applicability - how many sources, their size

N/A. This control measure will affect a large number of both point and area sources.

Emission Reductions by Pollutant-estimated reductions -
VOC only, NO_x only, VOC and NO_x combined

In 2005, 5.9 tpd of VOC are expected to be reduced.

Permanence

Emission reductions are assumed to be permanent.

Measurable

Emission reductions could be tracked via a review of source recordkeeping documentation.

Availability

No availability issues.

COST-EFFECTIVENESS - Estimated to be $Cost Savings - $100/ton of VOC (SCAQMD, 1994).

IMPLEMENTABILITY

Enforcement

Enforcement would be implemented through the recordkeeping requirements.

Ease of Determining Compliance

Compliance would be determined via review of facility recordkeeping material and on-site inspections.

Implementation Ease

The VOC limits of the rule may be technology-forcing for some operations. Some operations may require the use of different operating procedures (e.g., longer cleaning operations) or different equipment (e.g., cold cleaners designed for aqueous solvents).

Timing of Reductions

Assuming that limits could be put in place by 1998, then 1999 would be the year to apply reductions.

Publicly Acceptable

No issues are anticipated.

Politically Acceptable

Due to the low cost and relative availability of low-VOC substitutes, the should not be considerable issues related to political acceptability.

Consensual

Voluntary

Who Pays - Fairness

The control measure is designed to cover the bulk of the source category, so the costs are spread among both large and small sources.

Location

?

SECONDARY EFFECTS

Secondary Pollutant Benefits - CO, HAPS, etc.

Likely reductions of VOC HAPs with the use of low-VOC solvents.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

Since the volatility of aqueous solvents is significantly lower than the VOC counterpart, lower quantities of solvents may be needed on a per part cleaned basis.

Secondary Costs

None identified.

MEASURE NO. 5
SOURCE CATEGORY Gasoline Service Stations: Underground Storage Tanks
CONTROL MEASURE Install Pressure-Vacuum Valves on Vent Line

DESCRIPTION

The use of Pressure-Vacuum (PV) valves on UST vent pipes can reduce VOC emissions from tank breathing losses by 99%. This control measure would require that PV valves be installed on UST vent pipes at all Gasoline Service Stations and Fleet Operator fueling facilities. These P-V valves significantly reduce breathing losses from USTs and also increase the efficiency of Stage I and Stage II controls (Kununiak, 1996).

Some people have raised safety concerns regarding the use of P-V valves. Primarily, this relates to possible overpressure situations, if the valve were to fail and close. The CA State Fire Marshall reviewed this issue in 1990 and determined that there was no cause for safety concerns. In addition, the BAAQMD has had a requirement for P-V valves on all gasoline USTs since 1990 and for some USTs since the 1970's. No safety issues have resulted from this experience (Kununiak, 1996).

5. Gasoline Service Stations: Require the Use Pressure-Vacuum Valves on UST Vent Pipes
COST
Capital Cost According to SMAQMD (1995), capital costs are expected to be between $80 and $90 per valve. Owners can install these valves themselves, or pay about $200 per valve to be installed. The capital costs will vary by facility depending on the number of vent pipes, whether the vent pipes can be manifolded together and served by one P-V valve, and whether or not the owner installs the equipment. Another source quotes lower capital costs of about $50 to $80 per valve (Kununiak, 1996). Operating and Maintenance Cost There are no maintenance costs associated with P-V valves. Annualized Direct Costs An upper end of the annualized cost range was calculated using the following assumptions: small facility (75,000 gallons throughput/yr); one P-V valve needed; owner contracts the installation of valve at $200; and installation of valve is financed at 10% over 10 years. This leads to annual direct costs of $32.60/yr. Administrative Costs/Issues It would be necessary to verify installation of valves by the affected sources.

EFFICIENCY

Control Efficiency - % reduction from uncontrolled levels

99% for Stage I (an increase from 95% assumed to be used in the inventory); 99% for breathing losses; and a 2.3% increase in the efficiency of Stage II controls (Kununiak, 1996).

Applicability - how many sources, their size

Not Available. This control measure will affect a large number of area sources.

Emission Reductions by Pollutant-estimated reductions -
VOC only, NO_x only, VOC and NO_x combined

In 2005, 2.3 tpd of VOC are expected to be reduced (2.0 tpd from breathing losses; 0.1 tpd from Stage II; and 0.2 tpd from Stage I).

Permanence

Emission reductions are permanent.

Measurable

Emission reductions could be tracked via the performance tests required by the rule.

Availability

No availability issues. None of the air districts in California have experienced a problem with availability.

COST-EFFECTIVENESS - $615/ton is the upper end of the cost effectiveness range calculated using the annualized costs above and the hypothetical emissions from the Stage I&II controlled small facility above. Costs will likely be much lower since most facilities will have more than one vent pipe (that may be manifolded together) and will likely pay less for valves and installation.

IMPLEMENTABILITY

Enforcement

Enforcement would be implemented through periodic inspection and source reporting requirements.

Ease of Determining Compliance

Compliance would be determined via review of source reporting requirements/inspections.

Implementation Ease

This measure should be easily implemented. None of the air districts in California that have P-V valve requirements have reported implementation issues.

Timing of Reductions

Assuming that the requirement could be put in place by 1998, then 1999 would be the year to apply reductions.

Publicly Acceptable

No issues are anticipated.

Politically Acceptable

Due to the low cost, previous implementation in other areas, and the availability of equipment, there are no known issues that would make this measure politically unacceptable.

Consensual

Voluntary

N/A.

Who Pays - Fairness

The control measure is designed to cover all sources in the source category, so the costs are spread evenly among all sources.

Location

The requirement applies to all sources in the five county region.

SECONDARY EFFECTS

Secondary Pollutant Benefits - CO, HAPS, etc.

Reductions of VOC HAPs (e.g., benzene) will also occur as a result of this measure.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

Gasoline that would have been lost to the atmosphere can be used as fuel, which will lower overall gasoline consumption in the NAA.

Secondary Costs

None identified.

MEASURE NO. 7
SOURCE CATEGORY Petroleum Refinery Fugitives
CONTROL MEASURE More Stringent LDAR

DESCRIPTION

This control measure calls for an increase in the stringency of leak detection and repair (LDAR) programs at petroleum refineries. 25 PA Code 129.58 requires refineries to conduct a quarterly LDAR program using a 10,000 ppm VOC leak definition when monitoring components (e.g., pumps, valves). This control measure would be modeled after Rule 1173 of the SCAQMD and CARB's RACT (Pechan, 1994). The major differences in stringency are that: 1) the leak definition (the monitored level at which a component is considered to be leaking and therefore requires repair) is lowered from 10,000 ppm to 1,000 ppm; and 2) connectors are also monitored at 1,000 ppm on an annual basis.

The primary difference between the proposed rule described above and the Refinery MACT standard is that the MACT standard does not require LDAR for connectors (Pechan and Mathtech, 1994). Connectors would require quarterly LDAR until the number of leakers is limited to no more than one connector. When this performance requirement is met, the inspection schedule for connectors reverts to an annual schedule. EPA determined that the incremental costs outweighed the benefits for LDAR of connectors (e.g., pipe fittings). Another minor difference is that the leak definition for pumps is lower than the MACT standard (2,000 ppm). Conservative, incremental reduction and cost estimates between the MACT standard and the proposed rule are based solely on the requirement for inspection of connectors and are described in more detail below.

7. Refineries: Increased Stringency of Leak Detection and Repair Programs
COST
Capital Cost Component population data were not available for refineries in the 5 counties area. Using data from ten refineries in the SCAQMD (Pechan, 1994), capital costs associated with incorporating connectors into the LDAR program were estimated to be $3,667,500. Operating and Maintenance Cost Using the same SCAQMD refinery connector population figures, O&M costs were estimated to be between $158,000 and $597,000/yr. The range of values depends on whether the refineries were practicing quarterly or annual LDAR on connectors (i.e., whether or not they were meeting leak performance targets). Annualized Direct Costs Same as O&M above. Administrative Costs/Issues Annual indirect costs (overhead, administrative, taxes, insurance, and capital recovery costs) were estimated to be between $839,300 and $1,102,700, again depending on whether quarterly or annual LDAR was being performed.

EFFICIENCY

Control Efficiency - % reduction from uncontrolled levels

Reductions are based on estimates of the fraction of fugitive leak emissions contributed by connectors. This lack of a requirement for LDAR on connectors is the primary difference between the Refinery MACT and the proposed rule. Data from the SCAQMD on refineries that already inspect connectors on a quarterly basis (to comply with Rule 1173), indicate that connectors contribute 26% of the total controlled emissions (Pechan, 1994a). Instituting quarterly LDAR on these components is estimated to yield 70% control (Pechan, 1994a). This provides an overall incremental 18% control of the fugitive emissions. This estimate is considered to be conservative (low) because it is derived from data on components that are already being inspected. Therefore, the PA refineries are likely to have higher initial connector fugitive emissions contributions.

Applicability - how many sources, their size

From the 1990 inventory, there appear to be eight refineries in the five county area.

Emission Reductions by Pollutant-estimated reductions -
VOC only, NO_x only, VOC and NO_x combined

In 2005, 0.95 tpd of VOC are expected to be reduced (this reflects reductions for refineries in the five county area).

Permanence

Emission reductions are permanent.

Measurable

Emission reductions could be tracked via the performance source reporting requirements.

Availability

No availability issues.

COST-EFFECTIVENESS - estimated to be $680 - $1,150/ton of VOC estimated from data from SCAQMD refineries (Pechan, 1994a). Total annualized costs were $997,300 - $1,699,700 and total annual emission reductions were 1,471 tons (4.03 tpd). **NOTE: These values are derived from data on 10 SCAQMD refineries.**

IMPLEMENTABILITY

Enforcement

Enforcement would be implemented through periodic inspection and source reporting requirements.

Ease of Determining Compliance

Compliance would be determined via review of source reporting requirements/inspections.

Implementation Ease

This measure should be easily implemented, since an existing LDAR program requirement is in place.

Timing of Reductions

Assuming that limits could be put in place by 1998, then 1999 would be the year to apply reductions.

Publicly Acceptable

No issues are anticipated.

Politically Acceptable

Due to the low cost and previous implementation in other areas, there are no known issues that would make this measure politically unacceptable.

Consensual

Voluntary

N/A.

Who Pays - Fairness

The control measure is designed to cover all sources in the source category, so the costs are spread evenly among all sources.

Location

?

SECONDARY EFFECTS

Secondary Pollutant Benefits - CO, HAPS, etc.

Reductions of VOC HAPs (e.g., benzene) will also occur as a result of this measure.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

Vapors that would have been lost to the atmosphere can become product, lowering raw materials usage or product loss.

Secondary Costs

None identified.

MEASURE NO. 8
SOURCE CATEGORY Rule Effectiveness Improvements
CONTROL MEASURE Increased Compliance Activities

DESCRIPTION

This control measure calls for an improvement in the implementation of regulation. A rule effectiveness improvement may take several forms, ranging from more frequent and in-depth training of inspectors to larger fines for sources that do not comply with a rule.

8. Rule Effectiveness Improvements
COST
Capital Cost Not Available. For some sources, there will be no capital costs (e.g., increased reporting/recordkeeping). For others, capital costs may apply (e.g., increased stack monitoring). Operating and Maintenance Cost Not Available. Refinery component population figures needed to develop O&M costs. Annualized Direct Costs Not available. Administrative Costs/Issues There will be a large increase on the administrative burden of the state to increased rule effectiveness, including training costs, additional inspection costs, and review of increased facility reporting submittals. Facilities will also face additional administrative burdens, including increased reporting/ recordkeeping.
EFFICIENCY
Control Efficiency - % reduction from uncontrolled levels It is assumed that the rule effectiveness will be increased from 80% to 90% for emission points with base year RACT- or NSPS-level controls. Applicability - how many sources, their size Not Available. Emission Reductions by Pollutant-estimated reductions - VOC only, NO_x only, VOC and NO_x combined In 2005, VOC reductions equivalent to an additional 10% of the uncontrolled levels are expected for all affected sources.

Permanence

Emission reductions are assumed to be permanent.

Measurable

Emission reductions could be tracked via the performance source reporting requirements.

Availability

No availability issues.

COST-EFFECTIVENESS - Total annual costs are estimated to be 30% of the annual costs for any particular VOC control (Pechan, 1994b). Cost Effectiveness is unavailable.

IMPLEMENTABILITY

Enforcement

The control measure is based on increased enforcement activities (e.g., more frequent inspections, higher penalties, increased reporting).

Ease of Determining Compliance

Inherent to the rule, compliance would be determined via review of source reporting requirements and inspections.

Implementation Ease

Variable depending on the source and the methods chosen for rule effectiveness improvement.

Timing of Reductions

Assuming that limits could be put in place by 1998, then 1999 would be the year to apply reductions.

Publicly Acceptable

No issues are anticipated.

Politically Acceptable

Consensual

Voluntary

N/A.

Who Pays - Fairness

Location

?

SECONDARY EFFECTS

Secondary Pollutant Benefits - CO, HAPS, etc.

Reductions of VOC HAPs will likely occur as a result of this measure.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

Lower raw materials consumption or product loss may occur for some sources as a result of the rule.

Secondary Costs

None identified.

MEASURE NO. 9
SOURCE CATEGORY Web Offset Lithography
CONTROL MEASURE Beyond Control Technique Guideline Requirements

DESCRIPTION

This control measure calls for application of additional controls beyond RACT for Offset Lithographic Printers. EPA issued a draft CTG for Offset Lithography in 1993. This CTG was never finalized, but was followed up with an ACT document (EPA, 1994). The same controls were specified in the ACT document (e.g., low-VOC fountain solutions and solvents, 90% add-on control of drier exhaust). The controls were to be applied to all sources within the NAA, since EPA did not specify a lower-size threshold in the draft CTG (EPA, 1994).

Discussions with SCAQMD staff revealed that most of the sources have complied with SCAQMD Rule 1130 by using compliant fountain solutions and solvents. Even for those sources with heatset operations, most did not use add-on controls for the drier [driers are only used for heatset operations (Hopps, 1996)]. Additional add-on controls would only affect heatset web lithographers that had not installed controls previously. Also, in regards to the other two sources of VOC emissions, fountain solutions and solvents that are lower in VOC content than those specified in the draft CTG/ACT may not be available. SCAQMD Rule 1130 covering graphic arts, including offset lithography, was recently amended and includes VOC limits that are no more stringent (and possibly less stringent) than the draft CTG limits (SCAQMD, 1993). Rule 1130 limits fountain solution VOC content to 100 g/l, compared to 1.6% - 8.0% by volume (about 68 g/l of iso-propyl alcohol at 8.0%) in the CTG (depending on the process). Clean up solvents in Rule 1130 are limited to 900 g/l compared to 30% by volume in the draft CTG (about 330 g/l if calculated in terms of mineral spirits).

Additional information is needed regarding the types of solvents and fountain solutions used by sources in the NAA. Also, for heatset operations, information is needed as to the sources that are using add-on controls for the drier exhaust. If sources are generally in compliance with the draft CTG-limits, then additional emission reductions may be difficult to obtain with existing product formulations.

Web Offset Lithography: Beyond RACT Controls
COST
Capital Cost Not Available. Operating and Maintenance Cost Not Available. Annualized Direct Costs Not Available. Administrative Costs/Issues

EFFICIENCY

Control Efficiency - % reduction from uncontrolled levels

Applicability - how many sources, their size

Not Available.

Emission Reductions by Pollutant-estimated reductions -
VOC only, NO_x only, VOC and NO_x combined

Permanence

Measurable

Availability

COST-EFFECTIVENESS -

IMPLEMENTABILITY

Enforcement

Ease of Determining Compliance

Implementation Ease

Timing of Reductions

Publicly Acceptable

Politically Acceptable

Consensual

Voluntary

N/A.

Who Pays - Fairness

Location

?

SECONDARY EFFECTS

Secondary Pollutant Benefits - CO, HAPS, etc.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

Secondary Costs

None identified.

MEASURE NO. 10
SOURCE CATEGORY Graphic Arts
CONTROL MEASURE Extend RACT to Small Sources

DESCRIPTION

This control measure calls for application of RACT-level controls to small graphic arts sources. CTG-level controls are currently embodied in PA Rule 129.67 covering rotogravure and flexographic printing sources. The rule applies to sources with actual or potential emissions greater than 100 tpy or 1,000 lbs/day. Sources can comply by either limiting the VOC content of inks or using capture and control methods for the press emissions. No limits are specified for cleaning solvents.

A review of the 1990 emissions inventory found 13 facilities practicing flexography and six facilities performing gravure that had total surface coating emissions less than 0.5 tpd (and hence potentially not required to comply with the state regulation. The combined flexographic and gravure emissions from these facilities was representing 2.22 tpd in 1990. Some of these facilities may be using compliant formulations regardless of the state regulation or may have potential emissions above the 0.5 tpd limit (requiring compliance). Therefore, the 2.22 tpd figure represents an upper end of the emissions available for control.

An alternative to the above control measure would be to institute more stringent VOC limits for all sources. According to EPA (1995), if these limits were consistent with those used by both SCAQMD and the Bay Area Air Quality Management District (BAAQMD), emission reductions of up to 50% for those facilities complying with RACT through the use of compliant coatings. The comparison made by EPA shows that the California districts' limits of 0.24 lb VOC/lb solid compares with an equivalent RACT limit of 0.50 lb VOC/lb solid. As previously mentioned, these reductions only apply to the portion of the source category that use compliant coatings as RACT (since the source has a choice of using add-on controls versus low-VOC coatings).

10. Graphic Arts: Extend RACT Controls to Smaller Sources
COST
Capital Cost Not Available. It is likely that no capital costs would be involved, only changes to compliant coatings and process changes. Operating and Maintenance Cost Not Available. Annualized Direct Costs Not Available. Administrative Costs/Issues Although not currently required under the state regulation, administrative costs would be incurred by both industry and the state during reporting/recordkeeping to demonstrate compliance, if these requirements were included in the control measure.

EFFICIENCY

Control Efficiency - % reduction from uncontrolled levels

Based on the requirements for add-on control emission reduction requirements from the draft CTG, a 65% reduction is assumed. Hence, it is also assumed that if compliant coatings are used to comply with the rule, then similar emission reductions will occur.

Applicability - how many sources, their size

Not Available.

Emission Reductions by Pollutant-estimated reductions -
VOC only, NO_x only, VOC and NO_x combined

Emissions in 2005 are estimated at 2.37 tpd. Using the 65% emission reduction estimate above, VOC reductions in 2005 would be about 1.54 tpd.

Permanence

Reductions are assumed to be permanent.

Measurable

Reductions could be measured via facility reporting/recordkeeping requirements, if these are included as part of the control measure.

Availability

As mentioned in the introductory section, the availability of emission reductions hinges on whether or not the identified small emitters are currently using formulations that are compliant with RACT. If these facilities are already using compliant coatings (due to their ready availability or cost) then a portion or all of the emission reductions may not be available.

COST-EFFECTIVENESS - $3,500-4,800/ton (based on add-on controls; STAPPA/ALAPCO, 1993). Switching to lower VOC formulations should be much more cost effective.

IMPLEMENTABILITY

Enforcement

Enforcement would be performed via review of source reporting or recordkeeping.

Ease of Determining Compliance

Compliance determinations would also be determined via review of reporting or recordkeeping.

Implementation Ease

Switching to lower VOC inks may require some facilities to change operating practices or install higher capacity driers (STAPPA/ALAPCO, 1993). Other facilities may be able to transition to the lower VOC formulations without having to make significant changes.

Timing of Reductions

If a revision to the existing RACT rule can be adopted by 1998, then 1999 would be the year in which to take credit for reductions.

Publicly Acceptable

No issues anticipated.

Politically Acceptable

No issues anticipated.

Consensual

?

Voluntary

N/A.

Who Pays - Fairness

Location

?

SECONDARY EFFECTS

Secondary Pollutant Benefits - CO, HAPS, etc.

Some VOC HAPs may be reduced as a result of this measure.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

Since, the new formulations will have a lower VOC content (largely replaced by water), there will be fewer raw materials consumed per print job.

Secondary Costs

None identified.

MEASURE NO. 13
SOURCE CATEGORY Utility Boilers
CONTROL MEASURE Selective Catalytic Reduction (SCR)

Criteria for Evaluating Ozone Control Measures (Revised 6/20)
COST:
Capital Cost Average Coal Fired Utility Boiler is about 2250 mmbtu/hr. According to EPA SCR can be added to these boilers at a cost of: $20,250,000 per boiler Operating and Maintenance Cost Operating and maintenance costs are made up of a fixed component which includes equipment maintenance, personnel expenses and overhead costs. In addition there is a variable cost which includes consumables such as electricity and chemicals. According to EPA the fixed cost for the average utility boiler is: $1,441,000 The variable cost assuming a utilization of 50% is: $1,058,000 the total operating and maintenance cost is $2,502,000 Annualized Direct Costs For a typical 2250 mmbtu/hr input boiler the total annual cost is: 6,600,000/yr Administrative Costs/Issues Recordkeeping - Sources would be required to install CEM systems and chemical usage monitoring systems.
EFFICIENCY
Control Efficiency - % reduction from uncontrolled levels 80% -- This represents the reduction from current levels. All utility boilers have installed low NOx burners and reductions are taken from the level of installed equipment. Applicability - how many sources, their size in 5 county Ohio area There are three coal fired utility boilers. The average size is about 2250 mmbtu/hr. The system would also reduce emissions when these plants fire oil or gas as a secondary fuel.

Emission Reductions by Pollutant-estimated reductions -
VOC only, NO_x only, VOC and NO_x combined

NOx emission reductions from 1996 levels would be about 24 tpy in 2005. The reductions are above the emission control measures already in place at PECO plants.

Permanence

Reductions are expected to be permanent.

Measurable

Emission reductions would be measurable either through stack sampling or Continuous emission monitoring

Availability

The control equipment is available

No availability issues.

COST-EFFECTIVENESS - cost/ton for each precursor and for both precursors combined, over the lifetime of the control

The cost effectiveness for any particular unit is a function of unit size and utilization. On average, a cost effectiveness of about $4,000/ton removed can be expected. This is based on annual emissions from the affected plants of about 6,400 tons/year.

IMPLEMENTABILITY

Enforcement

Enforcement would be through recordkeeping requirements. The sources are ones which are routinely inspected.

Ease of Determining Compliance

During the compliance inspection, compliance could be determined easily.

Implementation Ease

The number of sources is small and equipment is available.

Timing of Reductions

Emission reduction could be implemented within four years after the regulations requiring the control technology were implemented.

Publicly Acceptable

Politically Acceptable

Consensual

Voluntary

Who Pays - Fairness

Location

SECONDARY EFFECTS

Secondary Pollutant Benefits - CO, HAPS, etc.

Emissions of ammonia may increase slightly.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

None

Secondary Costs

MEASURE NO. 12
SOURCE CATEGORY Pesticides
CONTROL MEASURE Reformulation and Application Changes

DESCRIPTION

This control measure calls for reformulation of pesticides and changes to application techniques for agricultural and commercial enterprises (household and institutional products are regulated under consumer products rules). The term pesticide includes insecticides, fungicides, and herbicides (SCAQMD, 1994). Both EPA Region IX (for the CA FIPs) and SCAQMD have proposed rules to limit VOC emissions from pesticide application. Region IX's FIP approach was to require manufacturers to register data on their products with EPA. EPA was then to set VOC limits for each product type. All persons within the FIP areas were then prohibited from using or storing pesticides that did not meet the VOC limits (SCAQMD, 1994).

SCAQMD's proposed approach is to use both VOC reformulation and changes in application techniques to reduce VOC emissions. Methods proposed to limit VOC content include: reformulation from hydrocarbon bases to water bases; adding thickening agents to increase particle size and viscosity of the spray which, in turn, reduces spray drift; substituting lower vapor pressure solvents to reduce evaporation; and using synthetic formulations. Methods proposed for changes in application include: dusting rather than spraying, where reformulation is not possible; modifying the spray device, such that fine droplets are not formed during application; lowering the spray nozzle height; and incorporating pesticide into the soil immediately following or in place of spraying (SCAQMD).

SCAQMD's proposed rule was selected over EPA's FIP rule, since SCAQMD's proposed rule allows for much more flexibility in achieving compliance. The California Department of Pesticide Regulation (DPR) is currently developing a statewide regulation to cover pesticide application (Pritchard, 1996). As specified in the CA SIP, DPR must put a control program in place to achieve a 20% reduction in VOC emissions by 2005. The program is expected to obtain emission reductions via both voluntary reformulations from manufacturers and mandatory reformulations and changes in application technique (since voluntary reductions are expected to fall short). The regulation is expected to be in place by 6/97.

12. Pesticides: Lower VOC Constituents/Changes in Application Techniques
COST
Capital Cost Not Available. Operating and Maintenance Cost Not Available. Annualized Direct Costs Not Available.

Administrative Costs/Issues

The State of California already has a sophisticated recordkeeping and regulatory system in place. Therefore, any recordkeeping and reporting burden associated with a VOC regulation would be minimal in California. In PA however, there could be much more of a burden both on the source and the State, if such a system is not already in place. It is assumed that, administrative costs would be incurred by both the sources and the state for reporting/recordkeeping requirements. These are not included in the cost effectiveness value reported below.

EFFICIENCY

Control Efficiency - % reduction from uncontrolled levels

20% (Pritchard, 1996).

Applicability - how many sources, their size

Not Available.

Emission Reductions by Pollutant-estimated reductions -
VOC only, NO_x only, VOC and NO_x combined

Emissions in 2005 are estimated at 1.43 tpd. Using the 20% emission reduction estimate above, VOC reductions in 2005 would be about 0.29 tpd.

Permanence

Reductions are assumed to be permanent.

Measurable

Reductions could be measured via facility reporting/recordkeeping requirements, if these are included as part of the control measure.

Availability

All emissions in the inventory are assumed to be available for reduction.

COST-EFFECTIVENESS - $1,000/ton (SCAQMD, 1994). CA DPR has not yet gathered any cost information for it's regulation currently under development (Pritchard, 1996).

IMPLEMENTABILITY

Enforcement

Enforcement would be performed via review of source reporting or recordkeeping.

Ease of Determining Compliance

Compliance determinations would also be determined via review of reporting or recordkeeping.

Implementation Ease

Since no pesticide rules have yet gone into effect, it is not yet clear how difficult the rule would be to implement. The SCAQMD's proposed rule would be much more difficult to implement than the EPA FIP rule due to the number of different ways that sources could consider for compliance. However, this greater flexibility would also be much more palatable to the sources which would increase the ease of implementation to some degree.

Timing of Reductions

If a rule can be adopted by 1998, then 1999 would be the year in which to begin taking credit for reductions. Full reductions should not be assumed until 2005, when CA will have its program fully implemented (Pritchard, 1996).

Publicly Acceptable

No issues anticipated.

Politically Acceptable

No issues anticipated. As stated above, the proposed SCAQMD rule would allow for greater flexibility and likely more approval from the regulated community.

Consensual

Voluntary

According to Pritchard (1996), CA DPR has not been very successful in obtaining voluntary reductions over the last couple of years. Therefore, no voluntary reductions are assumed here.

Who Pays - Fairness

The control measure would cover all agricultural and commercial sources.

Location

The measure would cover the 5 county area.

SECONDARY EFFECTS

Secondary Pollutant Benefits - CO, HAPS, etc.

Some VOC HAPs may be reduced as a result of this measure, as well as primarily or secondarily formed PM. Changes in application techniques could lead to lower exposures of off-site receptors to VOC HAPs.

By allowing sources to use dusting instead of spraying, emissions of PM could be increased in certain circumstances.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

Since, the new formulations will have a lower VOC content (replaced by water in some instances) and application techniques will be changed to reduce drift, there will be fewer raw materials consumed per application.

Secondary Costs

None identified.

MEASURE NO. 13
SOURCE CATEGORY Gas/oil utility/electricity producing boilers
CONTROL MEASURE Selective Catalytic Reduction (SCR)

Criteria for Evaluating Ozone Control Measures (Revised 6/20)
COST:
Capital Cost The typical boiler size is about 1,000 mmbtu/hr According to EPA the cost for this size boiler is: $8,500,000 per boiler Operating and Maintenance Cost Annual cost is made up of a fixed and variable component. The fixed component covers operation and maintenance of the equipment and the variable portion covers the chemicals and electricity required. The fixed component for the 1000 mmbtu/hr boiler is expected to be: $580,000 The variable component is: $373,333 The total O+M cost is: $963,000 Annualized Direct Costs For a typical 1,000 mmbtu/hr input boiler the annual cost is: $2,370,000 Administrative Costs/Issues Sources would be required to install CEM systems and chemical usage monitoring systems. Recordkeeping - Sources would be required to maintain operation and maintenance records for the SCR equipment.
EFFICIENCY
Control Efficiency - % reduction from uncontrolled levels 80% - Moderate efficiency is due to the controls already in place at these facilities. Applicability - how many sources, their size About 12 boilers are classified as utility or electricity producing boilers. The typical size of boilers is about 1,000 mmbtu/hr, although some of the industrial boilers are smaller.

Emission Reductions by Pollutant-estimated reductions -
VOC only, NO_x only, VOC and NO_x combined

Based on 1996 emissions of 38 tons/day in the ozone season, a reduction of 30 tons/day is possible.

Permanence

Reductions are expected to be permanent.

Measurable

Emission reductions are measurable through CEM or stack testing

Availability

No availability issues.

COST-EFFECTIVENESS - cost/ton for each precursor and for both precursors combined, over the lifetime of the control

Cost effectiveness varies by size and utilization of each boiler. On average a cost effectiveness of $4,400/ton removed can be expected.

IMPLEMENTABILITY

Enforcement

Enforcement would be through recordkeeping requirements. Sources are those which are routinely inspected.

Ease of Determining Compliance

During the compliance inspection, compliance could be determined easily.

Implementation Ease

The potential number of sources and the addition of previously nonregulated sources could pose difficulties in complete implementation.

Timing of Reductions

Emission reduction could be implemented within two years.

Publicly Acceptable

Politically Acceptable

Consensual

Voluntary

Who Pays - Fairness

Location

SECONDARY EFFECTS

Secondary Pollutant Benefits - CO, HAPS, etc.

Ammonia emissions may increase slightly.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

None

Secondary Costs

MEASURE NO. 14
SOURCE CATEGORY Gas/oil boilers >50 mmbtu/hr
CONTROL MEASURE Low Nox Burners (LNB)+ Flue gas recirculation (FGR)

Criteria for Evaluating Ozone Control Measures (Revised 6/20)
COST:
Capital Cost The range of boiler sizes for this category is very wide (from 50 to 300 mmbtu/hr). A typical size for the boiler is about 75 mmbtu/hr. According to EPA, a LNB+FGR system should cost between $200,000 and $450,000 per boiler. The average cost is: $322,000 Operating and Maintenance Cost Annual cost is made up of both a direct cost associated with the new equipment as well as a 1% fuel cost savings. The fuel savings offsets most of the O+M cost. The expected annual O+M cost is: $7,000 per year per boiler Annualized Direct Costs For a typical 75 mmbtu/hr input boiler the annual cost is: $ 70,000/yr Administrative Costs/Issues Recordkeeping - Sources would be required to monitor FGR parameters, including O2 levels. Larger sources have probably installed this equipment, but smaller sources have not.
EFFICIENCY
Control Efficiency - % reduction from uncontrolled levels 65% -- This should represent an average control efficiency. Some sources may do better and others would not do as well. Applicability - how many sources, their size A large (about 125) number of sources would be affected. Emissions are concentrated in a few (~25) sources where the energy is used for process use as well as space heating. Emission Reductions by Pollutant-estimated reductions - VOC only, NO_x only, VOC and NO_x combined Based on 1996 emissions the reduction in ozone season emissions should be about 16.5 tons/day. Permanence Reductions are expected to be permanent.

Measurable

Emission reductions would be determined through the monitoring of other performance measures such as O2 levels. Measurements would be secondary.

Availability

No availability issues.

COST-EFFECTIVENESS - cost/ton for each precursor and for both precursors combined, over the lifetime of the control

Cost effectiveness varies by size and utilization. Cost effectiveness is expected to fall into a range of $2,000-4,000/ton.

IMPLEMENTABILITY

Enforcement

Enforcement would be through recordkeeping requirements. Most of the sources in this category are already regulated and inspected.

Ease of Determining Compliance

During the compliance inspection, compliance could be determined easily.

Implementation Ease

There appear to be no issues

Timing of Reductions

Emission reduction could be implemented within two years after the effective date of regulations.

Publicly Acceptable

Politically Acceptable

Consensual

Voluntary

Who Pays - Fairness

Location

SECONDARY EFFECTS

Secondary Pollutant Benefits - CO, HAPS, etc.

None

Secondary Benefits - materials, agricultural, tourism, land use, etc.

None

Secondary Costs

MEASURE NO. 14
SOURCE CATEGORY Industrial Boilers - Bituminous Coal fired (all sizes)
CONTROL MEASURE Low NO_x Burners (LNB)

Criteria for Evaluating Ozone Control Measures (Revised 6/20)
COST:
Capital Cost The typical coal fired boiler is about 150 mmbtu/hr and is fired with pulverized coal. According to EPA a LNB for this size boiler will cost about: $ 700,000 Operating and Maintenance Cost Typical O+M cost for this size boiler is about $140,000/yr Annualized Direct Costs For a typical 150 mmbtu/hr input boiler the annual cost is: $ 250,000 per boiler Administrative Costs/Issues Recordkeeping - For LNB only, no additional recordkeeping would seem to be required.
EFFICIENCY
Control Efficiency - % reduction from uncontrolled levels 60% -- This should represent an average control efficiency. Some sources may do better and others would not do as well. Applicability - how many sources, their size There are four industrial boilers identified as burning pulverized coal. Emission Reductions by Pollutant-estimated reductions - VOC only, NO_x only, VOC and NO_x combined Based on an ozone season emission rate of 3.03 tons per day, the emission reduction would be 1.8 tons/day. Permanence Reductions are expected to be permanent.

Measurable

Emission reductions could be determined through stack test or CEM.

Availability

No availability issues.

COST-EFFECTIVENESS - cost/ton for each precursor and for both precursors combined, over the lifetime of the control

For a typical 150 mmbtu/hr boiler with a utilization of 60 percent the cost effectiveness of LNB would be about $2,400 per ton removed.

IMPLEMENTABILITY

Enforcement

Enforcement would be through recordkeeping requirements. Coal fired boilers are typically regulated.

Ease of Determining Compliance

During the compliance inspection, compliance could be determined easily.

Implementation Ease

Timing of Reductions

Emission reduction could be implemented within two years after the regulations are effective.

Publicly Acceptable

Politically Acceptable

Consensual

Voluntary

Who Pays - Fairness

Location

SECONDARY EFFECTS

Secondary Pollutant Benefits - CO, HAPS, etc.

CO and VOC emissions may increase slightly.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

None

Secondary Costs

MEASURE NO. 18
SOURCE CATEGORY Glass Manufacturing
CONTROL MEASURE NO_x Controls Beyond RACT

DESCRIPTION

This control measure would require NO_x controls beyond RACT for glass manufacturing facilities. EPA issued an ACT document for this source category in 1994 (EPA, 1994c). In this ACT, EPA listed the following control techniques and control efficiencies for glass furnaces: electric boost (10%), cullet preheat (25%), LNB (40%), SNCR (40%), SCR (75%), and oxy-firing (85%). Emission reductions of about 20% were assumed to occur by 1996 through the application of RACT. This control measure calls for additional controls that will achieve emission reductions equivalent to SCR (i.e., either SCR or oxy-firing). SCR or oxy-firing (use of oxygen instead of air for fuel combustion in the furnace) is assumed to achieve at least 75% incremental control of NO_x from glass furnaces.

18. Glass Manufacturing: Beyond RACT NO_x Controls

COST

Capital Cost

EPA (1994c) estimated the following model plant capital costs for SCR and Oxy-firing:

Plant	SCR ($10^3)	Oxy-firing ($10^3)
Pressed/Blown Glass (50 ton glass/day)	528	1,930
Container Glass (250 ton glass/day)	1,390	5,070
Flat Glass (750 ton glass/day)	2,690	9,810

Operating and Maintenance Cost

Not available.

Annualized Direct Costs

EPA (1994c) estimated the following model plant annual costs for SCR and Oxy-firing:

Plant	SCR ($10^3)	Oxy-firing ($10^3)
Pressed/Blown Glass (50 ton glass/day)	404	706
Container Glass (250 ton glass/day)	769	1,860
Flat Glass (750 ton glass/day)	1,200	3,590

Administrative Costs/Issues

No administrative costs were available.

EFFICIENCY

Control Efficiency - % reduction from uncontrolled levels

A 75% incremental efficiency is assumed for either SCR or oxy-firing. Oxy-firing may produce even higher emission reductions.

Applicability - how many sources, their size

From the emissions inventory, there are four companies listed within the Glass Manufacturing SCCs in seven records for glass furnaces. It is assumed that these represent four different facilities with a total of 7 furnaces.

Emission Reductions by Pollutant-estimated reductions - VOC only, NO_x only, VOC and NO_x combined

In 2005, 1.2 tpd of NO_x are expected to be reduced.

Permanence

Emission reductions are permanent.

Measurable

Emission reductions could be tracked via the performance tests or CEM data, if required by the rule.

Availability

No availability issues.

COST-EFFECTIVENESS - EPA (1994c) estimated that the cost effectiveness for SCR on an uncontrolled furnace would range from $800/ton to $2,960/ton. The cost effectiveness for oxy-firing on an uncontrolled furnace was estimated at $2,150 - $5,300/ton. It is assumed that the cost effectiveness range for SCR would not change significantly relative to the estimates for uncontrolled sources. The control efficiency of 75% is still rather conservative for SCR. Also, the effects of the lower mass of emissions available for reduction from the RACT-controlled sources (i.e., lower emission reductions relative to uncontrolled sources leading to an increase in cost effectiveness) would be offset to a certain degree. This would occur due to the lower amounts of reagent needed for RACT-controlled sources relative to uncontrolled sources, which would lower operating costs.

Based on the data presented by EPA (1994c), the cost effectiveness for oxy-firing is assumed to be up to 40% higher than an installation on an uncontrolled source (this is equivalent to the 40% mass of emissions that are unavailable for reduction due to RACT controls).

IMPLEMENTABILITY

Enforcement

Enforcement would be implemented through periodic inspection and source reporting requirements. CEM would be an option for the proposed control measure that has not been included in the cost estimates.

Ease of Determining Compliance

Compliance would be determined via review of source reporting requirements/inspections.

Implementation Ease

No issues regarding implementation were identified.

Timing of Reductions

Assuming that the requirement could be put in place by 1998, then 1999 would be the year to apply reductions.

Publicly Acceptable

No issues are anticipated.

Politically Acceptable

No issues were identified.

Consensual

Voluntary

N/A.

Who Pays - Fairness

The control measure is designed to cover all sources in the source category, so the costs are spread evenly among all sources. No lower size cut-offs have been specified.

Location

The requirement applies to all sources in the five county region.

SECONDARY EFFECTS

Secondary Pollutant Benefits - CO, HAPS, etc.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

Secondary Costs

Use of SCR will create ammonia slip emissions. Ammonia can combine with sulfate and nitrate to form secondary particulates (i.e., $PM_{2.5}$). Costs and secondary emissions are also associated with the production of the reagent (e.g., ammonia or urea) and the production of electrical energy needed by the control equipment.

MEASURE NO. 23
SOURCE CATEGORY Gas/oil refinery process heaters
CONTROL MEASURE Low NO_x Burner plus Flue Gas Recirculation.

Criteria for Evaluating Ozone Control Measures (Revised 6/20)
COST:
Capital Cost The average size process heater in the refinery industry is about 40 mmbtu/hr. At that size a mechanical draft heater is assumed. For a 40 mmbtu/hr heater the estimated capital cost is: $ 234,000 Operating and Maintenance Cost Operating and maintenance costs for a 40 mmbtu/hr heater are: 9,270 Annualized Direct Costs For a typical 40 mmbtu/hr input heater the annual cost is: $ 40,000/yr per boiler Administrative Costs/Issues Recordkeeping - Sources would be required to monitor O2 levels and record fuel use. Larger installations would probably be doing this as a matter of routine, but it would be an additional cost for smaller heaters
EFFICIENCY
Control Efficiency - % reduction from uncontrolled levels 65% -- This should represent an average control efficiency. Some sources may do better and others would not do as well. Applicability - how many sources, their size There are approximately 80 process heaters in the inventory. The average size heater is about 40 mmbtu/hr Emission Reductions by Pollutant-estimated reductions - VOC only, NO_x only, VOC and NO_x combined Estimated emissions from this source category are 10.4 tons per day. Emission reductions of 6.76 tons per day are possible.

Permanence

Reductions are expected to be permanent.

Measurable

Emission reductions would be determined through the monitoring of other performance measures such as O2 levels. Measurements would be secondary.

Availability

No availability issues.

COST-EFFECTIVENESS - cost/ton for each precursor and for both precursors combined, over the lifetime of the control

Cost effectiveness varies by size and capacity factor. Cost effectiveness is expected to fall within a range of 1500-2300/ton.

IMPLEMENTABILITY

Enforcement

Enforcement would be through recordkeeping requirements. Sources such as these are routinely inspected under current regulations.

Ease of Determining Compliance

During the compliance inspection, compliance could be determined easily.

Implementation Ease

The potential number of sources and the addition of previously non regulated sources could pose difficulties in complete implementation.

Timing of Reductions

Emission reductions could be implemented within two years.

Publicly Acceptable

Politically Acceptable
Consensual
Voluntary
Who Pays - Fairness
Location
SECONDARY EFFECTS
Secondary Pollutant Benefits - CO, HAPS, etc.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

None

Secondary Costs

MEASURE NO. 24
SOURCE CATEGORY Iron and Steel Mills
CONTROL MEASURE NO_x Controls Beyond RACT

DESCRIPTION

After further review of the point source database file for the Philadelphia NAA, there does not appear to be any iron and steel furnaces that would be covered by the EPA's 1994 ACT Document. Therefore, it is assumed that no emission reduction benefits could be gained via implementation of the following rule. It is recommended that the rule be dropped from further consideration, unless a source(s) is identified that would be covered by the ACT.

This control measure would require NO_x controls beyond RACT for reheating, annealing, and galvanizing furnaces at iron and steel mills. EPA issued an ACT document for this source category in 1994 (EPA, 1994). In the ACT, EPA listed combustion controls [low excess air, LNB, LNB + (flue gas recirculation)] as being applicable to all three furnace types. For annealing furnaces, EPA also considers add-on controls (SNCR and SCR) as being applicable. For the purposes of this analysis, it has been assumed that LNB has been the chosen RACT level of control for all iron and steel furnaces. This control measure calls for additional controls that will achieve emission reductions equivalent to LNB + SCR on annealing furnaces, and LNB + FGR on reheating and galvanizing furnaces.

24. Iron and Steel Mills: Beyond RACT NO_x Controls

COST

Capital Cost

EPA (1994) estimated the following model plant capital costs for SCR applied to annealing furnaces and FGR applied to reheating and galvanizing furnaces:

Furnace Type	SCR ($10^3)	FGR ($10^3)
Annealing	528	-
Galvanizing	-	5,070
Reheating	-	9,810

Operating and Maintenance Cost

Not available.

Annualized Direct Costs

EPA (1994) estimated the following model plant capital costs for SCR applied to annealing furnaces and FGR applied to reheating and galvanizing furnaces:

Furnace Type	SCR ($10^3)	FGR ($10^3)
Annealing	528	-
Galvanizing	-	5,070
Reheating	-	9,810

Administrative Costs/Issues

No administrative costs were available.

EFFICIENCY

Control Efficiency - % reduction from uncontrolled levels

A 75% incremental efficiency is assumed for either SCR or oxy-firing. Oxy-firing may produce even higher emission reductions.

Applicability - how many sources, their size

From the emissions inventory, there are

Emission Reductions by Pollutant-estimated reductions - VOC only, NO_x only, VOC and NO_x combined

In 2005, 1.2 tpd of NO_x are expected to be reduced.

Permanence

Emission reductions are permanent.

Measurable

Emission reductions could be tracked via the performance tests or CEM data, if required by the rule.

Availability

No availability issues.

COST-EFFECTIVENESS - EPA (1994c) estimated that the cost effectiveness for SCR on an uncontrolled furnace would range from $800/ton to $2,960/ton. The cost effectiveness for oxy-firing on an uncontrolled furnace was estimated at $2,150 - $5,300/ton. It is assumed that the cost effectiveness range for SCR would not change significantly relative to the estimates for uncontrolled sources. The control efficiency of 75% is still rather conservative for SCR. Also, the effects of the lower mass of emissions available for reduction from the RACT-controlled sources (i.e., lower emission reductions relative to uncontrolled sources leading to an increase in cost effectiveness) would be offset to a certain degree. This would occur due to the lower amounts of reagent needed for RACT-controlled sources relative to uncontrolled sources, which would lower operating costs.

The cost effectiveness for oxy-firing is assumed to increase modestly (up to 20%, equivalent to the mass of emissions that are unavailable for reduction).

IMPLEMENTABILITY

Enforcement

Enforcement would be implemented through periodic inspection and source reporting requirements. CEM would be an option for the proposed control measure that has not been included in the cost estimates.

Ease of Determining Compliance

Compliance would be determined via review of source reporting requirements/inspections.

Implementation Ease

No issues regarding implementation were identified.

Timing of Reductions

Assuming that the requirement could be put in place by 1998, then 1999 would be the year to apply reductions.

Publicly Acceptable

No issues are anticipated.

Politically Acceptable

No issues were identified.

Consensual

Voluntary

N/A.

Who Pays - Fairness

The control measure is designed to cover all sources in the source category, so the costs are spread evenly among all sources. No lower size cut-offs have been specified.

Location

The requirement applies to all sources in the five county region.

SECONDARY EFFECTS

Secondary Pollutant Benefits - CO, HAPS, etc.

Secondary Benefits - materials, agricultural, tourism, land use, etc.

Secondary Costs

Use of SCR will create ammonia slip emissions. Ammonia can combine with sulfate and nitrate to form secondary particulates (i.e., $PM_{2.5}$).

MEASURE NO. 26
SOURCE CATEGORY Residential Water Heaters
CONTROL MEASURE Low NO_x Burners

DESCRIPTION

This control measure would require that new residential water heater installations meet NO_x emission standards. Also owners of residential water heaters are required to replace their water heater at the end of its useful life with a heater meeting the same NO_x standards. This control measure is based on SCAQMD's 1994 proposed measure (SCAQMD, 1994). The State would initiate a water heater certification program for all manufacturer's selling water heaters in the NAA.

Further discussion with SCAQMD has revealed that the district is unlikely to issue any new standards for residential water heaters (Lee, 1996). While residential water heaters have been demonstrated to meet an emission limit of 10 ng/J, these units are not thought to be cost effective at present. SCAQMD will revisit this issue in 1999 during the preparation of the 2000 Air Quality Management Plan. It is recommended that emission limits consistent with SCAQMDs current limits of 40 ng/J be adopted instead, since these units have been in production for many years.

COST

Capital Cost

Not available.

Operating and Maintenance Cost

Not available.

Annualized Direct Costs

Not available.

Administrative Costs/Issues

No administrative costs were available.

EFFICIENCY

Control Efficiency - % reduction from uncontrolled levels

In 2005, the control efficiency for the proposed measure (assuming implementation of the measure by 1999) would be 13%. This is based on the assumption of a 12.5 year life for water heaters, 50% replacement between 1999 and 2005, an uncontrolled average emission rate of 54.3 ng/J in 1999 (Pechan, 1993), and the proposed emission limit for new units of 40.0 ng/J in 2005 for the new/retrofitted units.

Applicability - how many sources, their size

This control measure would apply to all gas-fired residential water heaters in the five county region.

Emission Reductions by Pollutant-estimated reductions -
VOC only, NO_x only, VOC and NO_x combined

It is assumed that the emission inventory's residential combustion category is made up primarily of natural gas. Using this assumption, for both control measures involving residential combustion (measures #26 and #27), 0.12 tpd of NO_x is expected to be reduced in 2005.

Permanence

Emission reductions are permanent.

Measurable

Emission reductions could be tracked via sales of certified equipment.

Availability

No availability issues, units meeting the 40 ng/J limit have been sold in the SCAQMD for many years.

COST-EFFECTIVENESS - Not available.

IMPLEMENTABILITY

Enforcement

Enforcement would be achieved through periodic inspections of distributors, retailers, and installers of water heaters located within the five county area.

Ease of Determining Compliance

Compliance would be determined via manufacturer's certification program. The manufacturer would be required to display the model number and certification status on the shipping carton and on the rating plate of the water heater.

Implementation Ease

Since the equipment is commercially-available, the main issue would be to allow adequate lead time for equipment vendors/installers to deplete/return their stock of non-compliant heaters.

The rule could also be implemented through a market-based approach (SCAQMD, 1994). Under this approach, new equipment meeting the emission standards would be eligible for emission credits.

Timing of Reductions

Assuming that the requirement could be put in place by 1998, then 1999 would be the year to begin applying reductions. The entire 13% reduction would not occur in 1999, however. The emission reductions would be dependent on the fraction of water heaters that were retrofitted during each year. It could be assumed that emissions would be reduced approximately 2% per year from 1999 to 2005.